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SCIENCE

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VOL. XLVII No. 1221

FRIDAY, MAY 24, 1918

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SCIENCE

FRIDAY, MAY 24, 1918

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SOME PROBLEMS OF NUTRITION IN THE ARMY[1]

FOOD has been defined as a well-tasting mixture of materials, which, when taken in proper quantity into the stomach, is capable of maintaining the body in any desired state. The choice of these mixtures in the form of menus, their preparation for the plate, their digestion and fate in the body, is the science of nutrition. If we had a complete knowledge of every food substance and the transformation it undergoes in the body; how it is prepared for usefulness, just what purpose it fulfils, how it fulfils this purpose and what becomes of it afterward—if we knew all this for every foodstuff; every class of substance we can use as food—we should have a *completed* science of nutrition.

A person is satisfactorily nourished when he is maintained in a physical and mental status—and we all know that food plays a part in maintaining mental as well as physical status—best fitted for the task he has to perform. We can begin now in view of the military situation in Europe to grasp the size of the task our army is destined to perform. What is the most desirable status, physical and mental, for our army? Very few of our soldiers have been in a fight, and none practically speaking, have lived the trench life—the life of the modern soldier. We have now under arms well on to a million and a half men who, six months ago, were leading peaceful pursuits—the majority of them, perhaps, sedentary, or at least unmuscular pursuits. In spite of

[1] Address delivered before the College of Physicians, Philadelphia, April 3, 1918.

the great part played by athletics in our national life, relatively few of our soldiers were athletes. The first requisite therefore was to create a body of well-muscled men. If you could see the great bodies of these men as I have seen them, you would agree that this aim is being rapidly achieved. The average soldier has gained both in weight and in height (a part of the latter is mere straightening up, but not all). Flabby muscle has given way to sinewy muscle. Fat has been reduced in many, and its place taken by active tissue. Such a change requires good food and, in the muscle-up period, a plentiful amount of muscle-forming materials, the best of which in the world is beef.

To gain a fighting spirit also requires good food—and plenty of it—to make the soldier contented, to make him feel well fed and "full of fight." This objective, also, I am sure, is being attained. Does any one grudge the soldier an abundance of food, even a little superabundance to be on the safe side, if these objects are being attained? I shall speak later of the element of waste which I know has been in your minds.

Army regulations define the ration as the allowance for subsistence of one man for one day. You will be interested in certain facts regarding the history of the ration as thus defined. The first legislation fixing the components of the army ration is dated November 4, 1775. The Continental Congress fixed at that time one pound of beef and one pound of bread as the allowance for each man per day, "3 pints of beans or peas at a price not to exceed $1.00 per bushel, one pint of milk, half a pound of rice or one pound of Indian meal per week, one quart of Spruce beer or cider for each man or nine gallons of molasses for each company of men per week." The ration also included candles and soap. The ration fixed July 16, 1798, is in some respects the same as we have to-day. At that time the allowance of beef was raised to 1¼ pounds or 20 ounces, the allowance of bread or flour to 18 ounces, rum, brandy or whiskey one gill, and the other items the same as in previous rations. In 1799 the issue of rum was placed at the discretion of the commander. In 1802 a provision was made for the conversion of strong liquors into wine and beer, otherwise the ration was the same as above. This ration continued through the War of 1812.

From time to time there was much controversy over the liquor component. In 1818 the following recommendation was made: "in a southern climate give molasses in lieu of whiskey or beer, and only one half pint of peas, beans or rice." Calhoun who was Secretary of War at this time, recommended that the liquor components of the ration be discontinued. This was concurred in by General Lovell, who was Surgeon General of the Army at that time. Congress, however, failed to act, and the liquor continued as a component of the ration until 1838.

During the War of 1812 there was much agitation on account of the failure of the contractor system. This system had prevailed previously, although much trouble had been experienced with it. In 1814 it broke down completely and the House of Representatives asked Monroe, then Secretary of War, for suggestions concerning a revision of the method of provisioning the army. A new system was worked out, but, peace having been signed with England, Congress adjourned and left the bill on the calendar. In 1817 the Seminole Indian outbreak in Georgia gave still another opportunity to show the weakness of the contractor system. Andrew Jackson, who was Commander of the Army, became so impatient with this system that he finally or-

ganized a commissary department for his own army entirely without authority from Congress and demonstrated that the army itself could handle the matter of supplies much better than outside contractors. This resulted in legislation dated April 11, 1818, which laid the foundations of our modern Subsistence Department. It should be explained here that the Subsistence or Commissary Department, which was separate and independent up to 1912, is now a part of the Quartermaster Corps.

The agitation for discontinuance of the liquor component in the ration came up at almost every session of Congress between 1812 and 1838. In 1832 coffee was for the first time made a part of the ration, and it was provided that six pounds of coffee and twelve pounds of sugar per 100 rations, that is, for one company of men, could be used in lieu of whiskey or rum at the rate of one gill a man each day. Nothing further was done with the army ration until 1856, when some agitation was started to increase the coffee and sugar components; after four years this modification was made, just before the outbreak of the Civil War. The ration which prevailed throughout the Civil War fixed by legislation dated August 30, 1861, was as follows:

Beef, 20 ounces,
Bread or flour, 22 ounces,
Potatoes, 16 ounces three times a week,
Beans, rice or hominy "in proportion with above."

Then for each company of men or 100 rations:

10 pounds coffee,
15 pounds sugar,
4 quarts vinegar,
4 pounds soap,
1½ pounds candles.

The peace-time ration, differing from the last named only in the absence of potatoes, beans, rice, hominy, etc., was returned to in 1865. These articles were restored by legislation dated 1892. Other minor changes were made which were continued in new legislation dated January 11, 1911. The "garrison ration," as it is known, as fixed by this last Act, is as follows:

20 ounces beef, or bacon 12 ounces,
18 ounces flour, or corn meal 20 ounces,
20 ounces potatoes,
2.4 ounces beans,
1.28 ounces prunes,
1.12 ounces coffee,
3.2 ounces sugar,
.32 gill syrup,
.50 ounce evaporated milk,
.50 ounce butter,
.64 ounce lard,
.16 gill vinegar,
.62 ounce salt,
.04 ounce pepper,
.014 ounce cinnamon,
.08 ounce baking powder,
.014 ounce flavoring extracts.

Besides this garrison ration, the American Army has three other rations. The *reserve ration* consists of hardtack or army bread, bacon, sugar, coffee, salt and pepper. This, according to regulations, forms the basis of field rations, but at the present time in France is being considerably modified according to the available supply. The so-called *travel ration* contains soft or hard bread, canned corned beef or corned beef hash instead of bacon, as in the reserve ration, baked beans, canned tomatoes, jam, coffee, sugar and evaporated milk. There is an allowance also for coffee already prepared when it can be obtained at railroad stations. The regulations provide for an *emergency ration* which has been well defined as simply "a substitute for nothing." This might also be called a tide-over ration. Many attempts have been made to concentrate into small space, so that it can be carried in the pack in a sealed parcel, the nec-

essary nutrients to maintain a soldier for twenty-four hours. The American Army has tried out half a dozen or more emergency rations but none of them have proved wholly successful. In conference with medical officers of the Navy and a representative of the Bureau of Home Economics of the Department of Agriculture, the Food Division of the Surgeon General's Office has reached the conclusion that no satisfactory emergency ration has yet been proposed and has taken the ground that the most satisfactory form of concentrated ration is hard bread supplemented by potted beef or ham, dried beef or sardines, and, when there is opportunity for the use of a portable cooker, three ounces of sliced bacon should be added.

Returning to the subject of the garrison ration, which forms the basis of feeding in all of our training camps, it should be explained that this ration as fixed by law does not prescribe what the men shall eat. It is merely used as the basis of the money allowance for the ration. A long list of substitutive articles is carried by the Quartermaster Corps, and the soldiers are allowed to eat anything they choose from this list, but they must not spend more than the amount of money represented by the cost of the garrison ration, with certain definite percentages of substitutions, at the time and place where they are stationed. For example, the value of the ration for this month at Washington Barracks is about 41 cents. This amount of money multiplied by the number of men in the organization is the amount which the mess sergeant may spend for food each day for his company. As a matter of fact, meat, bread and potatoes form the backbone of the ration now as always. The allowance of meat, 1¼ pounds including bone, for each man per day is purposely placed high, so as to cover all emergency requirements. The actual consumption of meat, as our food surveys have recently determined, is much lower than this. The average, I should say at this time, is not in excess of ¾ pound of meat for each soldier.

The list of substitutes makes provision for a considerable elasticity and variety in the diet. More than this, however, if the men do not like what the quartermaster has in store, they are at liberty to take money from the quartermaster in lieu of rations and buy materials outside. This is at the discretion of the commanding general. Where local market facilities are good, there is no objection to this method, provided the food supplied is carefully inspected. With an inexperienced mess sergeant, there is likely to be a waste of funds from this cause, but it sometimes happens that the local market is cheaper than the Quartermaster Department.

Let me now explain the actual workings of the mess system in vogue in our army. The soldiers are fed by companies or equivalents of companies, such as batteries of artillery, troops of cavalry, ambulance companies, field hospital companies, etc. According to the new tables of organization, an infantry company consists of 250 men. In the Civil War, remember, a company was only 100 men. Companies now, therefore, are practically the equivalent of battalions in those days, and a battalion of 1,000 men now is nearly the equivalent of the old regiment.

Each company in camps such as those now in existence in this country has an individual mess-hall with its appropriate kitchen equipment. When the cantonments were started, the company consisted of only 152 men, and some of the mess-halls were constructed on this basis, but they have since been enlarged in most camps, so that now it is possible to seat the entire company of 250 men at one time. The mess

conditions are under the supervision of a commissioned officer of the company designated by the captain and known as the mess officer. The purchasing agent of the company is a sergeant, known as the mess sergeant. It is his business to keep the mess accounts with the Quartermaster and to draw the rations for his organization. Staple articles, except meat and bread, which are issued every day, are drawn in "10"-day periods. This has been found by experience to be the most convenient period of time for a company. Each company has an adjoining store room which is supposed to be large enough to contain supplies for a 10-day period. At the beginning of this period the mess sergeant learns from the first sergeant of the company the number of men on the ration list. He multiplies this number by the value of the ration in money for the current month and multiplies this by ten to find the amount of his credit with the quartermaster for the ensuing period.

In conference with the company cook, the mess sergeant makes out menus for some days in advance and calculates the amount of each article required for the preparation of these menus. Such menus are supposed to be approved by the mess officer or the company commander and by some medical officer. You will be interested, I think, in knowing how these menus run. I quote from one for Company A, 301st Field Signal Battalion, November 5, 1917, at Camp Devens:

Breakfast

Oatmeal, milk and sugar,
Pork sausages,
Fried potatoes,
Bread and butter,
Coffee.

Dinner

Roast pork or roast beef,
Baked potatoes,
Bread and butter,
Cornstarch pudding,
Coffee, milk and sugar.

Supper

Beef stew,
Corn bread,
Karo,
Prunes,
Tea.

SUNDAY, NOVEMBER 4, 1917

Breakfast

Corn-meal mush, sugar and milk,
Hash,
Potatoes,
Bread and butter,
Karo,
Coffee.

DINNER

Roast pork,
Baked potatoes,
Celery,
Turnips,
Peas,
Cranberry sauce,
Mince pie,
Ice cream,
Cocoa.

Supper

Cold pork sandwiches,
American cheese,
Crackers,
Cocoa.

On the whole it must be said that the mess system in vogue in the American Army works well. Its weak points at this time are obviously the inexperience of the mess officer and the mess sergeant, the fact that good cooks are not available, and the absence of an adequate system of inspection. It was the realization of these weak points in our system together with the importance of conservation of our food re-

sources and the concern of the Surgeon General for the nutritional interests of the army, that led to the organization of the Food Division of his office. The object of this division might be expressed briefly in this way: to apply the science of nutrition to the problems of feeding the army. We wish to secure for the soldier perfect nutrition with the least possible waste of food. The government is not in the least niggardly with the army: indeed, we must not conserve to the point of denying the soldier anything he should have.

It should not be understood that it is the work of the Food Division of the Surgeon General's Office to supply food for the army. As already explained, this is done by the quartermaster. The Quartermaster Corps conducts practically all of the business of the army, and the quartermaster attached to the camp or to a tactical division is, so to say, the business agent of that unit. He purchases all the food, transports it and places it in storage at some place available for the camp or army. Upon requisition by the different organizations, he issues the food, as already explained, and carries in stock the entire list of articles prescribed in the garrison ration and in the list of substitutes. He may also have what is known as a "Sales Department" which contains a considerably wider range than the list of substitutes. For example, the patent breakfast foods—Post Toasties, Puffed Wheat, Puffed Rice, and other package foods—can be purchased through this sales department.

The work of the Food Division is largely of an advisory or inspectorial nature. We have been authorized now by the Secretary of War to do three things: First, to inspect all the food of a camp with reference especially to its nutritive value; Second, to seek to improve the mess conditions (cooking and serving of the food) to the end that a properly balanced menu will be employed and the food served in palatable form; third, to determine the actual consumption of the food and the amount of waste and report these facts to the Division Commander. The division contains now 65 officers and some 50 enlisted men. A Nutritional Survey Party, as it is called, consists of four officers and several enlisted men. This party visits a camp and spends from two to four weeks studying food conditions and making recommendations through the chief surgeon to the commanding officer of the camp. We have nine such parties operating at the present moment. Each party makes a tour of from four to six camps and then goes back over the same ground to observe especially what improvements have been made.

A first contingent of six officers under the leadership of Major Philip A. Shaffer, dean of the medical department of Washington University, has gone abroad to report to General Pershing for similar service in France. Their duties will be to aid in proper nutrition and messing of troops and supervising the conservation of food so that it shall be consistent with adequate feeding of soldiers in campaigns.

Already the Food Division has been able to improve food conditions in a considerable number of camps. Our officers have caught at the subsistence stores spoiled meats and spoiled canned goods and have condemned them. They have suggested improvements in mess arrangements, in menus, and have given systematic instruction to the mess officers and mess sergeants in food values and the proper uses of foods. In many instances their recommendations, having the full force of recommendations from the Surgeon General himself, have been adopted without question. In addition, we have already gathered a considerable body of information regarding the ac-

tual consumption of food and the amount of waste.

TABLE I

Page from Statistical Report of Food Consumption in the Training Camps.

	Food per Man per Day				Consumed Distr. of Fuel Value, Per Cent.	Wasted, Per Cent.	Per Man per Day
	Nutrients	Supplied	Wasted	Consumed			
Camp Travis							
0042 90th Div., Caisson No. 1, 11/7–13/17	Protein, gm.	117	15	102	14	13	Consumed cost, 37 c.
	Fat, gm.	101	18	83	25	18	Waste cost, 5 c.
	Carbohydrate, gm.	519	54	465	61	10	Total waste, .50 lb.
	Fuel value, cal.	3,547	450	3,097	100	13	Edible waste, .22 lb.
0043 90th Div., Co. A, 357 Inf., 11/8–14/17	Protein, gm.	135	5	130	13	4	Consumed cost, 37 c.
	Fat, gm.	185	6	179	40	3	Waste cost, 1 c.
	Carbohydrate, gm.	505	16	489	47	3	Total waste, .50 lb.
	Fuel value, cal.	4,345	142	4,203	100	3	Edible waste, .15 lb.
0044 90th Div., Co. B, 357 Inf., 11/8–14/17	Protein, gm.	85	3	82	15	4	Consumed cost, 31 c.
	Fat, gm.	68	3	65	26	4	Waste cost, 1 c.
	Carbohydrate, gm.	346	10	336	59	3	Total waste, .37 lb.
	Fuel value, cal.	2,399	81	2,318	100	3	Edible waste, .13 lb.
Ft. Sam Houston							
0040 Base Hosp. Det. Mess, 11/4–10/17	Protein, gm.	112	4	108	17	4	Consumed cost, 40 c.
	Fat, gm.	105	6	99	34	6	Waste cost, 2 c.
	Carbohydrate, gm.	333	12	321	49	4	Total waste, .36 lb.
	Fuel value, cal.	2,801	121	2,680	100	4	Edible waste, .19 lb.
Wadsworth							
0068 27th Div., Bat. E, 106 FA, 12/5–11/17	Protein, gm.	170	4	166	16	2	Consumed cost, 49 c.
	Fat, gm.	187	7	180	38	4	Waste cost, 2 c.
	Carbohydrate, gm.	507	15	492	46	3	Total waste, .82 lb.
	Fuel value, cal.	4,515	143	4,372	100	3	Edible waste, .46 lb.
0069 27th Div., Co. I, 12 NY Inf., 12/6–13/7	Protein, gm.	151	8	143	14	5	Consumed cost, 42 c.
	Fat, gm.	126	5	121	26	4	Waste cost, 3 c.
	Carbohydrate, gm.	674	42	632	60	6	Total waste, .95 lb.
	Fuel value, cal.	4,554	252	4,302	100	6	Edible waste, .68 lb.
0070 27th Div., Co. I, 106 Inf., 12/6–12/17	Protein, gm.	118	9	109	14	8	Consumed cost, 36 c.
	Fat, gm.	89	4	85	25	4	Waste cost, 3 c.
	Carbohydrate, gm.	516	38	478	61	7	Total waste, .90 lb.
	Fuel value, cal.	3,428	230	3,198	100	7	Edible waste, .58 lb.

The accompanying table shows one page out of our statistical report of actual feeding conditions in individual mess houses (Table I.). As shown on this page, in three messes in Camp Travis, Fort Sam Houston, Texas, and base hospital mess and three messes at Camp Wadsworth, Spartanburg, South Carolina, the food consumption is expressed on the man-per-day basis. This is obtained by first making an inventory of the amount of food on hand in the company storehouse, at the beginning of a definite period, second, a list of accessions to stock during the period, and third, an inventory at the end of the period. The second inventory subtracted from the sum of the first, plus accession to stock gives the amount of food used. Concurrently with this, the garbage is separated into several cans, one for spent bone, one for peel and other inedible refuse such as coffee grounds, egg shells and the like, and one for table or edible waste. This last fraction is weighed, sampled and analyzed. The total nutrients contained in the edible waste subtracted from the total nutrients contained in the food as supplied, gives the actual consumption of food. This table gives a good idea

of the very high variation of food consumption, ranging as noted from 2,300 to 4,300 calories per man per day. One reason for this large variation is the availability of extra foods at camp exchanges and adjacent restaurants. The table shows also a high variation in the amount of waste and is fairly typical of the difference we have found between the National Army Camps and the National Guard Camps. This difference is largely due to the fact that, in the National Army Camps, schools for cooks and bakers have been in operation from the very beginning and at the time these surveys were made, the cooks in the National Army Camps, although having had only a couple of months' experience, were already much more efficient than the cooks in the National Guard Camps who had not received instruction in such schools. It should be stated, however, that the National Army Camps are much better equipped as regards their kitchens, they have better ranges, better storehouses and more conveniently arranged mess halls than have the National Guard Camps.

The general public is naturally very much interested in this matter of waste. Numerous reports from civilians who have visited the camps have reached our office to the effect that there is gross and wanton waste of food. These observations, as a rule, are purely casual, and in many instances, at least, are incorrect. In the construction period of the camps, the construction contractor was responsible for a great deal of the visible waste of food. The ordinary civilian visiting such a camp and seeing evidence of waste did not distinguish between the civilian contractor and the army. Whole heads of cabbage, whole potatoes, spoiled hams, joints of beef, etc., could be seen in the garbage pails, in the garbage wagons, or garbage cans, and a hasty conclusion was reached that the army was thus wasting food. Our officers have now visited all of the large military camps, numbering altogether in the neighborhood of forty. They have very rarely seen in any of the camps any such evidence of waste as reported in these private letters, which unfortunately have found their way to the public press. It is a great exception to see whole potatoes or large pieces of bread, or bones with meat attached in any considerable amount in any of the garbage cans from the army mess houses. I have personally visited 22 camps, and have looked into thousands of garbage cans, and bear witness that in the great majority of these cans one does not see more waste proportionately than can be seen in the garbage of an ordinary household.

We have recently had reports from Camp Funston and Camp Sevier which show that the waste has been reduced to such a point that it is practically negligible. For example, in one mess house in Camp Funston where more than 200 men were fed, the total edible waste from three meals was only six ounces; at Camp Sevier the report of our party working there at the present time is that, in a considerable number of mess houses, the total waste from a meal is not over one half pound. This means satisfactory discipline and, especially, it means inspection of plates at the end of the meal. Conservation has been made a subject of division orders in these camps and others, the instructions being that men shall not take on their plates more than they can eat, violation of this order being made a cause for punishment. Company commanders at their discretion can compel a man to eat at the next meal anything he has left on his plate. It means also satisfactory serving arrangements. It has been the experience of our officers that the most economical way of serving men in large numbers is by what we call the squad system. If possible, men

should be seated by squads and should be served by their own squad leader. The essence of the system is, however, that the squad leader shall have authority over the serving of his men. He either serves the food himself on their plates or at least sees to it that no man takes more food than he can eat, and reports him if he does.

It should be remembered that these company households are still very young. None of them in the National Army are more than six months old. To take a body of 250 men at random from the civilian population and train them in six months in the handling of this large quantity of food, so that there should be no undue waste, is indeed a fine accomplishment.

Many problems are arising constantly in connection with our work. We were faced at the start with the fact that there is very little exact information on the amount of food required by the army in training or in the field. Such information as exists is obtained from the record of purchases in the Quartermaster Corps, or the corresponding departments of other armies, and not from the estimation of food consumed directly. We have, I believe, the first instance in the history of warfare, where the actual amount of food consumed is estimated directly in the camp and in the field where the troops are operating. This is made possible by our system of feeding men by companies. In this way, it is possible to check up closely also on the relative cost of the different foods. We find, for example, that where more meat is used the cost of the ration is always higher. Meat, so far as we can learn yet, represents the most expensive article of diet, but meat is also one of the most important articles of food, especially for soldiers in the muscling-up period of their training. Experiments by Thomas and others show that the nitrogenous waste of the body is most readily replaced by the nitrogenous constituents of meat. Meat, then, is the most economical repair material for muscle and other active tissues. Next to meat comes the protein of milk and eggs, and below these the proteins of cereals, legumes, beans, peas, etc. It has been proposed by Professor Lusk to call these most economical proteins, proteins of Class A, meaning that they are most valuable for the purpose of repair and restoration of tissue, and hence also for the growth of tissue, in the whole list of food stuffs.

We were faced also at the beginning with the question of what should be the optimum amount of protein in the ration. Authorities now generally agree that muscular work does not involve a breakdown of muscle tissue, rather the contrary. A man who has not been accustomed to work, when he begins actual muscular exercise instead of breaking down muscle will build up muscle and it has been abundantly proved by numerous experiments that the breakdown of nitrogenous material in the body does not increase in muscular work over the amount broken down in complete muscular rest. This is a surprising fact, but it is now quite incontrovertible. Muscular work is done at the expense of potential energy in the form of carbohydrate and fat. There is much evidence also that this energy can be derived most economically from carbohydrate food, especially from sugar, and this doubtless explains the craving of men in muscular training for sweets. These facts would indicate that a relatively small amount of protein or meat in the diet would be sufficient for muscular work. It is quite possible that our soldiers could get along with considerably less than they are using, although our investigations show that they are actually using much less than the government allowance. There are some facts, however, which deter us at present from

recommending a radical reduction in the amount of meat in the ration. First of all is the fact that meat stimulates heat production in the body more than any other food stuff, and therefore assists in keeping the body warm in severe weather. There is some evidence that for a quick delivery of maximum energy, such as may be necessary in getting "over the top," a high protein diet is necessary. We certainly desire that the American soldier shall have plenty of "punch" to his fight, and if a high protein diet will insure this punch, nobody, I am sure, will grudge him all the meat he feels like eating.

United States rations, both for ordinary encampment training and for field uses. The British field ration is the ration used in the training camps in France. When the men go into the trenches or engage in active operations, this is supplemented by the addition of pea soup, butter and sugar amounting to 300–500 calories. The Canadian diet No. 40 is taken from an actual weekly diet sheet as used in the Canadian training camps in England last September. The French normal ration is the training ration, the reserve ration corresponds very closely to our own reserve ration and their strong ration is their campaign ration.

TABLE II

Comparison of Allies' Rations

Ration	Weight				Fuel Value				Distribution		
	Total	Protein	Fat	Carbohydrates	Protein	Fat	Carbohydrates	Total	Protein	Fat	Carbohydrates
	Gm.	Gm.	Gm.	Gm.	Cal.	Cal.	Cal.	Cal.	%	%	%
British Field	1,461	143	154	440	586	1,432	1,804	3,822	15.3	37.5	47.2
British Field and Trench	1,893	144	174	463	590	1,618	1,898	4,106	14.3	39.4	46.3
Canadian, Oct. 1, 1917	1,860	151	182	460	619	1,693	1,886	4,198	14.7	40.3	45.0
Canadian Diet No. 40	622	132	127	363	541	1,181	1,488	3,210	16.9	36.8	46.3
French, Normal	1,261	141	89	467	578	828	1,915	3,321	17.4	24.9	57.7
French, Reserve	1,091	112	114	385	460	1,063	1,580	3,103	14.8	34.3	50.9
French, Strong	1,362	152	97	509	623	902	2,087	3,612	17.2	25.0	57.8
Italian Combating	1,366	142	67	519	582	623	2,128	3,333	17.5	18.7	63.8
Italian Territorial	1,116	94	50	415	385	465	1,701	2,551	15.1	18.2	66.7
U. S. Garrison	1,935	175	125	671	718	1,163	2,751	4,632	15.5	25.1	59.4
U. S. Garrison, Modified	1,803	166	178	657	681	1,655	2,694	4,809	13.5	32.9	53.6
Average, 87 messes	1,940	139	130	536	570	1,209	2,198	3,997	14.3	30.4	55.3

Other armies are getting along on less meat than allowed by the government to our army. The British army allows 1 pound per man per day, the French army $\frac{3}{4}$ pound, the Italian army only $\frac{1}{2}$ pound. Our allowance, you will remember, is $1\frac{1}{4}$ pounds, but the actual consumption by our army up to the present time in the camps in this country does not exceed $\frac{3}{4}$ pound. It would therefore seem that $\frac{3}{4}$ pound of meat provides a sufficiency of protein of this class.

Table II. exhibits a comparison of the British, Canadian, French, Italian and Corresponding rations for the Italian army are the territorial and combating rations. The United States garrison ration as laid down by the regulations, provides as shown here 4,632 calories per man per day. When, however, this ration is made the basis of money allowance, certain substitutes are made, for example, 30 per cent. of meat is issued as bacon, 20 per cent. of the allowance for potatoes is issued as onions, and 10 per cent. as tomatoes. With these substitutes made throughout, the garrison ration, "modified" as we call it, provides 4,809 calories. Now, the average con-

sumption in the training camps as shown by our surveys is to date just a little less than 4,000 calories. On this diet, supplemented of course by a certain consumption of food from the camp exchanges, the men have gained in weight on an average of about 9 pounds since entering the training camps. Some organizations even show an average gain of as much as 20 pounds, others only 2 or 3 pounds, but the average throughout the army, according to the best information we can obtain to-day, is in the neighborhood of 9 pounds per man. Compare with this army ration, the average consumption of food as shown by recent family dietary studies made by the Bureau of Home Economics under Dr. Langworthy at the Department of Agriculture (Table III.).[2] Note that the consumption of food per man per day in farmers' families is quite similar to that as already shown for the average allied soldier in training. The work of the soldier in training, therefore, so far as its intensity is concerned, may be closely compared with the work of a farmer. According to an article published recently in *Nature*, the average consumption of food among the English munition workers for 1917 where more than 18,000 observations were taken, is 3,463 calories. Summarizing again, we may say the average American farmer uses about 3,500 calories, the average English munition worker very nearly the same, the average soldier of the Allies, considering British, Canadian, French, Italian and American forces, in training camps about the same amount and in actual campaigns some 500 calories more.

TABLE III

Family Dietary Studies

	No. of Fam.	Average Income	Days per "Man"	Cost	Per "Man" per Day			
					Protein, Gm.	Fat, Gm.	Carbo., Gm.	Calories
Garment makers	7	$ 724	168	.38	109	80	494	3,130
Professional men	17	2,208	434	.564	99	149	438	3,490
Teachers	32	2,150	620	.473	88	126	428	3,200
Farmers	12		384	.436	101	130	503	3,585
Engineers (professional)	5	2,252	97	.526	85	124	395	3,035
Laborers	6	1,497	205	.35	94	102	481	3,220
Salesmen	5	2,527	121	.449	88	111	405	2,970
Mechanics	10	1,303	309	.44	95	113	444	3,175
Mother wage earners	12	923	326	.33	105	66	440	2,955
Retired	5	1,647	130	.48	81	121	420	3,095
Clerks	11	1,934	225	.50	90	119	417	3,040
Weighted averages	122	1,799[4]	3,019	.438	94	117	438	3,180

Another problem in which we have been greatly interested is whether the soldiers should be given all the sweets they crave. Our survey parties in the military camps have determined the actual consumption of food from the exchanges or "canteens," as they used to be called, as well as from the mess house. In one camp where there was but a single exchange, it was possible to determine the average consumption with a high degree of accuracy. In these canteens or regimental exchanges, the foods which are bought by the soldiers are for the most part candies and light drinks (the food value of which is represented entirely by a

[2] Through Dr. Langworthy's courtesy I am permitted to show these figures for the first time.

[3] "Man" = all members of the family reduced to the basis of men.

[4] Average 110 families.

syrup), cakes, pies, ice cream, etc., in other words, articles of food which would be classified as sweets. In this particular camp it was found that the average soldier bought in the neighborhood of 500 calories of energy every day in the form of sweets. This represents fairly typical conditions. Wherever it has been possible to estimate with any degree of accuracy at all the consumption of food from these exchanges, we have found figures ranging in the neighborhood of those just quoted. We may say, then, that the average soldier craves in the form of sweets, which represent quick energy in much the same way that alcohol in small quantity represents quick energy for the body, food amounting to about one eighth of his total daily requirements. The question may fairly be asked whether the government would not be well advised to reduce the quota of meat and replace the amount thus saved with sweets, provided as a part of the ration.

Still another question of great interest, not only for the army but for the entire civilian population, is the question of dehydrated vegetables. As a means of preservation and therefore of conservation of our food supply, dehydration or drying has already proved its place. By means of improved appliances, this measure may now be extended to classes of food stuffs not ordinarily preserved by drying. Potatoes, cabbage, spinach, strawberries and many other articles usually preserved by other means may now be dehydrated much more effectively than by ordinary means of drying, and may be preserved in this dehydrated condition for a considerable length of time, if not indefinitely. The importance of this measure for the army lies in the saving of tonnage or cargo space in transportation of food materials across the country and across the water. Major Samuel C. Prescott, of the Food Division, has prepared an exhaustive report on the subject of dehydration covering all phases of the subject from the saving in the space to the chemical composition and microbiology of the product. Immediately after this report was submitted to the Quartermaster Department, that department began placing orders for dehydrated vegetables such as potatoes, onions and carrots for the use of General Pershing's army. As yet the tonnage contracted for is not large, but in all probability in the very near future dehydrated vegetables will become a staple article in our army rations, as they have already become in the ration of the British army. Thousands of tons of dehydrated vegetables are being prepared in Canada, some also in the United States for the British army. By simply soaking in water and boiling in the same water, these vegetables are brought back to the condition of fresh vegetables so perfectly that very often they can not be distinguished from the fresh vegetables themselves. Another advantage of such products is the very high saving of time in the company kitchen. Dehydrated vegetables put up in packages are ready for the kettle; this saves the work of one or two men a day.

It is fairly safe to predict that before very long methods will be found for the dehydration of meat as have already been found for the dehydration of milk. Such measures remove many dangers of food poisoning. Meat spoilage is almost entirely due to imperfect refrigeration, but if the water is taken out of the meat, it does not need to be refrigerated. Bacteria can not grow without water. The Food Division through investigation made at the Harriman Research Laboratory in New York, has already found a satisfactory method of making meat powder, by dehydration at low temperature and a high vacuum. This can be used as a component of soup

stock or dried hash which requires only a short soaking in water and boiling to make a very delicious dish. The Bureau of Chemistry under the direction of Dr. Alsberg is also working on this problem, as is also the Bureau of Animal Industry under Dr. Mohler. There should be, as a result of these studies, in time a very large saving in the cost of living. Imagine the difference in the cost of transportation of milk with and without its water content, quite aside from the saving in the cost of refrigeration. Milk is 88 per cent. water, meat is about 70 per cent. water. Practically all of the water can be extracted from milk, leaving a powder which will go into solution readily and, by combining with sweet butter, can be turned out as a product of any desired composition. Already it is possible to deliver milk of this kind, which at current retail prices costs 14 cents a quart, for less than 9 cents a quart. There should be a corresponding saving in the cost of meat, for two of the largest factors in the cost of meat to-day are refrigeration and freight charges. In the case of milk, the reconstituted article is just as palatable as the original milk and is very much safer, for it can be pasteurized twice, once just before powdering, and again just after reconstitution with little extra cost. In the case of meat in the form of soup stock, hash and stew, which form the bulk of meat consumption in the army, the product again is just as palatable as the original meat.

There are many other aspects of the problem of nutrition of the army which would interest you had I the time to take them up in detail. One of the most interesting to us in the office has been the preparation of some special rations for the use of our own American prisoners in Germany and for the use of sick soldiers and prisoners. One of the first things the Food Division was asked to do after its organization early in September was the preparation of an American Prisoners' ration. This request came from the American Red Cross, and after a few days we had prepared for them a ration which could be shipped in bulk to the Red Cross Headquarters at Berne, Switzerland, and packed in parcels not to exceed 11 pounds in weight, according to the specifications required by the German government, and sent three times every two weeks to the American prisoners held in Germany. It was our task to see that such a parcel contained enough food value for the American prisoner to last him until the next parcel should be due to arrive. Articles had to be selected which could be packed in small cartons, and which would be certain to keep for the necessary length of time. These articles also had to be such as could be prepared readily for eating under the limited facilities of the prison camp. The list as finally made up runs somewhat as follows: rice, sugar, dried beef, pork and beans, peanut butter, soda crackers, evaporated milk, milk chocolate, desiccated strawberry, jam, nutmargarine and dried figs. Provision was also made for variation and substitution such as tea for coffee, marmalade for jam, oleo for nutmargarine, dried apples, apricots, etc., for dried figs, hominy for rice, corned beef for dried beef, etc. I think we may all feel comforted by the thought that if an American soldier is taken prisoner, he will, by this beneficent arrangement of the Red Cross, at least be well fed. Information which seems to be perfectly reliable from the Red Cross representatives at Berne assures us that the British provisions for their soldiers, which are quite similar to ours, are not interfered with, in any way, by the German government at the present time.

The requirements of the sick soldier are very different from those of the healthy

soldier. Considerably more latitude is required in the selection of foods which may tempt the appetite of the soldier, if ill in bed. The realization of these facts led to another request from the Red Cross for a ration to be known as the Invalid Ration. This was designed in the first instance for American prisoners in Germany too ill to be out of bed, but it has been thought that the same ration could be used also by sick soldiers in our own hospitals in this country. This ration therefore has been constructed with the idea that it could be used by sick soldiers anywhere in our own service, or in the prison camp. The ration has been approved by the President and adopted. It follows: unpolished rice, yellow cornmeal, sugar, potted chicken, Julienne or compressed soup tablets, dried milk powder of malted milk, beef extract, minute tapioca or other form of prepared pudding crackers, tea, milk chocolate, marmalade, fresh fruit or fruit juice. These articles, however, are regarded as only supplementary to those of the regular ration, whether prisoners' ration or the garrison ration.

It is comforting just now to remember that the status of the science of nutrition in America is fully equal to its status in the land of our enemies at the beginning of the war. If we fail in the trial that is upon us, it will not be for lack of information. If we fail to keep our civilian population properly nourished, it will not be because we do not know the functions of food, or because we do not know what foods are suitable. Likewise with the army.

Our own government has been foremost in the support of scientific investigations along these lines. The names of Atwater, Chittenden, Lusk, Benedict, Mendel, Osborne, Taylor, McCollum, Alsberg, Armsby are known wherever the science of nutrition is studied, and the completeness of their work is openly admired and envied in England, France, Scandinavia, and even in Germany. Immediately preceding the outbreak of the war, no less than a dozen young German investigators of promise had studied in American laboratories, because the work of several of these laboratories was considerably in advance of similar laboratories in Germany or Austria. The support of these laboratories by the national government, by state governments, and by our wealthy benefactors, Carnegie, Rockefeller, Mrs. Sage and others was responsible for their splendid equipment. But the leadership also was not lacking. In fact, the scientific leadership pointed the way to the benefactions and governmental appropriations.

John R. Murlin

Food Division,
Surgeon-General's Office,
Washington, D. C.

ICELAND SPAR IN MONTANA

The existence of large deposits of pure calcite has recently been brought to the attention of the Bureau of Mines. These deposits occur near Gray Cliff, Montana, and have been inspected by Dr. S. C. Lind, of the Bureau. At the present time there is no considerable market for pure calcite. It is used for the manufacture of some kinds of glass. Perfect crystals of calcite are used in certain optical instruments. In the past practically all the optical material has been mined from one deposit in Iceland. The crystals from the Montana deposit appear to be the nearest approach to Iceland spar yet uncovered in any part of the world.

Since the seventeenth century science requirements for optically perfect calcite have been supplied almost wholly from the well-known but small deposit on the east coast of Iceland. This is a very remarkable occurrence, consisting of a cavity in basalt completely filled with enormous crystals of pure calcite. Rhombohedrons and scalenohehedrons with diameters as great as three feet have not been uncommon. In recent years, however, the

difficulty in securing first class spar from the Iceland deposit has steadily increased, much of the material taken out being useless for optical purposes.

Occasional finds of doubly refracting spar have been made elsewhere without resulting in the development of a new supply.

While the total amount of spar required is not great, the maintenance of a certain production is necessary for the manufacture of Nicols prisms to be used in dichroscopes for testing pleochroism of gem stones, polariscopes, polarizing microscopes and saccharimeters. Other substances having as great a difference in the refractive indices of the ordinary and extraordinary rays are all unsuitable for replacing Iceland spar in optical instruments.

It is possible that the Montana veins might be made to return a commercial product of spar if they were worked with sufficient care. From one vein six hundred pounds of crystals are said to have been shipped to an agent who sold the spar in Germany, receiving $3,000 therefor. These crystals had been sorted from thirty to forty tons of calcite blasted out in the sinking of a seventy-five-foot shaft.

The Montana deposit lies in two vertical veins in gneiss. The veins are four to seven feet wide, probably at least 100 feet deep, and are several miles long. The deposits are near the surface, easily mined, and quite accessible to the railroad. The crystals practically fill the entire vein without any admixture of foreign intrusions.

So far, no absolutely perfect crystals have been obtained from these veins, but it is altogether likely that a better product may be had by more careful mining. The imperfections are of two kinds. Some crystals have a very slight, gray cloudiness, which renders them unsuitable for optical purposes. This defect is inherent. The bulk of the material, however, while perfectly clear shows slight cleavage in the interior of the crystals. This may be and probably is due to the shocks to which the crystals are subjected in mining.

Some of the crystals were obtained by the Bureau of Mines and submitted to the Bureau of Standards for test. Their report is quoted below.

> The larger sample does show interference colors in places in its body as noted by ————. We are not, however, of the opinion that this renders the whole crystal useless for optical purposes. It would appear that good material for small optical parts (*e. g.*, small Nicols prisms) might be cut from this crystal.
>
> It is also true that the smaller sample is very slightly turbid (milky). This makes it not strictly first class, but for some purposes would not impair its use. Otherwise it is an exquisite sample. We would like to have for our own use a considerable supply of material.

If a market could be developed for pure calcite to pay for mining a large tonnage of these deposits, it appears altogether probable that good optical crystals could be obtained as a by-product in quantity sufficient for all scientific requirements, and so meet the need caused by the diminishing output from Iceland.

CHAS. L. PARSONS

BUREAU OF MINES,
WASHINGTON

SCIENTIFIC EVENTS

INVENTIONS SECTION OF THE GENERAL STAFF OF THE DEPARTMENT OF WAR

THE following statement is authorized by the War Department:

In order to secure prompt and thorough investigation of inventions submitted to the War Department an "Inventions Section" has been created as an agency within the General Staff. All inventions of a mechanical, electrical, or chemical nature submitted to the War Department for inspection, test, or sale are now considered by this section.

Inventions may be sent by mail or may be submitted in person, accompanied by written descriptions or drawings. They go first to an examining board having technical knowledge of the classes of inventions they handle, whose investigations determine whether the inventions have merit. Those with merit are referred to the Advisory Board, which determines in each case whether it should be put in the hands of some of the numerous testing and

developing agencies, or if it should go to one of the staff or supply departments for test and consideration of its adoption, and final acquirement of title if such action is desirable.

Composing the Advisory Board at present are the following: D. W. Brunton, member Naval Consulting Board and chairman War Committee of Technical Societies; Dr. Graham Edgar, member National Research Council; Colonel James W. Furlow, Quartermaster Department, chief of Motors Division; Colonel J. A. Hornsby, M.C., chief of Hospital Division, Surgeon General's Office; Lieutenant Colonel Morgan L. Brett, Ordnance Department, Engineering Branch; Lieutenant Colonel Robert A. Millikan, S.C., chief of Science and Research Division; Lieutenant Colonel N. H. Slaughter, S.C., chief of Radio Development Section; Major Joseph A. Mauborgne, S.C., chief of Electrical Engineering Section.

When completed the board will have 12 to 15 members to cover fully all of the various technical problems which may come before it.

In testing and developing inventions and in considering problems presented by staff departments, the Advisory Board works in connection with a number of agencies. Among them are the following: National Research Council; Bureau of Standards; War Committee of National Technical Societies (this committee consists of two members detailed from each of the 10 important technical societies in the United States); laboratories and shops of the staff and supply departments of the Army; Patent Office; Aircraft Production Board; all Army service schools; C. L. Norton, Massachusetts Institute of Technology, Cambridge, Mass.; Dr. Charles P. Steinmetz, General Electric Co., Schenectady, N. Y.; A. H. Beyer, chairman committee on testing laboratory, Columbia University, Broadway and 117th Street, New York City; R. R. Abbott, metallurgist, Peerless Motor Car Co., Cleveland, Ohio; Dr. John A. Matthews, president Halcomb Steel Co., Syracuse, N. Y.; Knox Taylor, president Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; Howard D. Colman, Baber-Colman Co., Rockford, Ill.; Preston S. Miller, Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York City; Herbert Fisher Moore, University of Illinois, Urbana, Ill.; L. F. Miller, metallurgist, Mitchell Moore Co., 1832 Asylum Avenue, Racine, Wis.; E. J. Okey, the Timken Roller Bearing Co., Canton, Ohio; Dr. Aleš Hrdlička, curator division of physical anthropology, United States National Museum, Washington, D. C.

Any person desiring to submit an invention for consideration, test, sale or development should do so by letter, giving in order the following information: Name and object of the invention; any claim for superiority or novelty; any results obtained by actual experiment; whether the invention is patented; whether remuneration is expected; whether the invention has been before any other agency; whether the writer is owner or agent; the number of inclosures with the letter. A written description and sketches or drawings of sufficient detail to afford a full understanding of the cases should also be submitted. Should the invention be an explosive or other chemical combination, the ingredients and processes of mixture should be stated.

The Inventions Section will not bear the expense of preparation of drawings and descriptions, nor advance funds for personal or travelling expenses of inventors.

Any matter submitted will be treated as confidential. The inventor will be notified of each step taken during the investigation of his invention. All communications should be addressed: Inventions Section, General Staff, Army War College, Washington, D. C.

THE VOLUNTEER MEDICAL RESERVE CORPS

Dr. Franklin Martin, member of the advisory commission and chairman of the general medical board of the Council of National Defense, authorizes the statement that following out the plans for organizing the volunteer medical service corps, to enlist the services of physicians ineligible for camp or field duty, the medical section of the Council of National Defense is sending to several thousand doctors a letter which says in part:

The Council of National Defense has authorized and directed the medical section of the council to

organize the physicians of the country who are ineligible for membership in the medical reserve corps on account of physical disability, over-age (55), civic or institutional needs, into the volunteer medical service corps. The members of this corps will be classified according to their ability to serve and will render aid to existing governmental agencies upon request of the Army, Navy, Public Health Service, American Red Cross, or the Council of National Defense.

It is hoped that every physician who, for any of the reasons enumerated above, is unable to enroll in the Medical Reserve Corps, will join the volunteer medical service corps. Since you have already indicated your desire to serve the government by applying for a commission in the Medical Reserve Corps you are among the first to be sent an application blank which it is hoped you will fill out and return immediately to this office.

The blank provides for details as to reason for ineligibility to the Medical Reserve Corps as to educational and professional experience and other details. The fact is also recognized that rejected applicants for service in the Medical Reserve Corps may overcome the physical defects that led to rejection, and may therefore become eligible, or that the essential public or institutional needs may become less important as the extreme needs of the Army and Navy become apparent. Each physician is asked, therefore, to pledge himself to apply for a commission in the Medical Reserve Corps if at any time he becomes eligible.

With the letter goes a leaflet setting forth the rules of the organization. The general management of the Volunteer Medical Service Corps is vested in a central governing board, which is a committee of the general medical board of the Council of National Defense, and the state governing boards consist of the state committees, medical section, Council of National Defense.

The procedure for joining is simple. The applicant returns his filled blank to the central governing board in Washington, and it is then referred to the proper state executive committee for its recommendations as to the qualifications of the applicant and as to the kind of work for which he seems most fitted.

The central governing board comprises the following: Dr. Edward P. Davis, president, Philadelphia; Dr. Henry H. Sherk, vice-president, Pasadena; Dr. John D. McLean, acting secretary, Washington; Dr. Edward H. Bradford, Boston; Dr. Truman W. Brophy, Chicago; Dr. Duncan Eve, Sr., Nashville; Dr. William Duffield Robinson, Philadelphia; Dr. George David Stewart, New York City; Dr. Franklin Martin, Chicago, and Dr. F. F. Simpson, Pittsburgh, are members *ex officio*.

THE NATIONAL RESEARCH COUNCIL

THE President has issued the following executive order:

The National Research Council was organized in 1916 at the request of the President by the National Academy of Sciences, under its congressional charter, as a measure of national preparedness. The work accomplished by the council in organizing research and in securing cooperation of military and civilian agencies in the solution of military problems demonstrates its capacity for larger service. The National Academy of Sciences is therefore requested to perpetuate the National Research Council, the duties of which shall be as follows:

1. In general, to stimulate research in the mathematical, physical and biological sciences, and in the application of these sciences to engineering, agriculture, medicine and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare.

2. To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.

3. To promote cooperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all cooperative undertakings to give encouragement to individual initiative as fundamentally important to the advancement of science.

4. To serve as a means of bringing American and foreign investigators into active cooperation with the scientific and technical services of the War and Navy Departments and with those of the civil branches of the government.

5. To direct the attention of scientific and technical investigators to the present importance of military and industrial problems in connection with the war, and to aid in the solution of these problems by organizing specific researches.

6. To gather and collate scientific and technical information, at home and abroad, in cooperation with governmental and other agencies, and to render such information available to duly accredited persons.

Effective prosecution of the council's work requires the cordial collaboration of the scientific and technical branches of the government, both military and civil. To this end representatives of the government, upon the nomination of the National Academy of Sciences, will be designated by the President as members of the council, as heretofore, and the heads of the departments immediately concerned will continue to cooperate in every way that may be required.

Woodrow Wilson

The White House,
11 May, 1918

SCIENTIFIC NOTES AND NEWS

Dr. John J. Carty, colonel in the Signal Corps, until recently chief engineer of the American Telephone and Telegraph Company, was presented with the Edison medal for "meritorious achievement in the science and art of electrical engineering," on May 17, at the annual meeting of the American Institute of Electrical Engineers.

Colonel Henry S. Graves, forester of the United States Forest Service, has been elected an honorary member of the Royal Scottish Arboricultural Society of Edinburgh, Scotland, in recognition of his eminent services to forestry. This distinction is shared by Colonel Graves with only one other citizen of this country, Dr. C. S. Sargent, who was elected in 1889.

At the annual meeting of the American Academy of Arts and Sciences held on May 8, acting on the recommendation of the Rumford Committee, it was unanimously voted to award the Rumford Premium to Theodore Lyman for his researches on light of very short wavelength.

At the commencement exercises of Colgate University, on May 7, the honorary degree of doctor of science was conferred upon Dr. Charles H. Herty, editor of *The Journal of Industrial and Engineering Chemistry.*

Dr. Alexis Carrel, of the Rockefeller Institute, has been promoted by the French government to the rank of Commander of the Legion of Honor. The new decoration was bestowed on May 16 by M. Mourier, Under Secretary of State for Medical Service, in the presence of a distinguished company. M. Mourier recalled Dr. Carrel's biological discoveries, his method of transfusion of blood, his conservation of living tissue, and his method of grafting bones, as well as the system of treating wounds which he has developed at the hospital at Compiègne.

The Franklin Institute, on May 15, 1918, made the annual presentation of its Franklin Medal in the auditorium of the Institute. The Franklin Medal, founded in 1914 and awarded only to "those workers in physical science or technology, without regard to country, whose efforts, in the opinion of the Institute, have done most to advance a knowledge of physical science or its applications," was awarded to Signor Guglielmo Marconi, electrical engineer and member of the Italian Senate, and to Dr. Thomas Corwin Mendenhall, physicist, of Ravenna, Ohio. The award to Senator Marconi was made in recognition of his "brilliant inception and successful development of the application of magneto-electric waves to the transmission of signals and telegrams, without the use of metallic conductors." The award to Dr. Mendenhall was made in recognition of his "fruitful and indefatigable labors in physical research, particularly his contributions to our knowledge of physical constants and electrical standards." His Excellency, Count V. Macchi De Cellere, on behalf of the Royal Italian Government, received the Franklin Medal for Senator Marconi, and addressed the institute when the medal was presented to him. Upon the presentation of the Medal to Dr. Mendenhall, he addressed the institute on the subject of "Some Metrological Memories."

Major O. M. Leland, of the 303d Regiment of Engineers, stationed at Camp Dix, has been appointed Lieutenant Colonel of Engineers in the National Army and assigned to the above regiment. Colonel Leland is professor of astronomy and geodesy at Cornell University,

on leave of absence for the duration of the war.

THE Massachusetts Institute of Technology has granted leave of absence to Professor Dugald C. Jackson, head of the department of electrical engineering, who has gone into government service, with the commission of major, and to F. H. Lahee, assistant professor of geology. Three men have resigned their positions, Ernest W. Chapin, research assistant in electrical engineering, who has been drafted, and Paul H. Burkhardt and Guy A. Gray, assistants in electrical engineering, who have gone to the Bureau of Standards in Washington. Professor D. F. Comstock, of the department of physics, has resigned.

FROM the department of chemistry of the College of the City of New York, Assistant Professor F. E. Breithut, who has already been granted a leave of absence for the duration of the war, has been commissioned as captain in the U. S. Army, and has reported for duty; Dr. B. G. Feinberg, tutor in chemistry, has been appointed research chemist in the Ordnance Division of the United States Army and was ordered to report for duty May 17; Mr. D. L. Williams, instructor in chemistry, has been called into the national service to be in charge of the Division of Supplies of the Research Department of the Gas Warfare Section of the United States Army, to report by June 1 at the latest. Mr. Paul Gross, tutor in chemistry, has been commissioned as second lieutenant in the United States Army, and was required to report for duty in Washington on May 9.

IT is reported from Oberlin College that Professor F. O. Grover, of the department of botany; Professor C. W. Savage, of the department of hygiene and physical education, and Professor S. R. Williams, of the department of physics and astronomy, will be away next year on sabbatical leave.

DR. MCIVERY WOODY, secretary of the medical faculty of Harvard University, and Dr. W. G. Webber, of the department of preventive medicine and hygiene, have been commissioned in the Medical Reserve Corps.

WILBUR A. NELSON has been elected state geologist of Tennessee.

MISS EDITH TALPEY, of Bayside, has been appointed chief chemist at the big plant of the General Chemical Company, at Kingston, Ontario. For the past four years she has been working in the laboratory of the Company at Long Island City.

HERBERT P. WHITLOCK has been appointed curator of mineralogy in the American Museum of Natural History in succession to the late Louis P. Gratacap. A correspondent writes: "Mr. Whitlock leaves his position as mineralogist in the New York State Museum at Albany after serving for a period of fourteen years. During this time he has brought the state collection of minerals to a high degree of excellence and has helped to make it a complete representation of the mineral occurrences of New York. Mr. Whitlock is well known for his published papers, principally on crystallographic mineralogy."

DR. M. R. GILMORE, curator of the North Dakota State Historical Society, delivered a series of lectures before the faculty and students of the University on May 2, 3 and 4, on "Native culture and its geographic relations." The subjects presented in the series were: "The relation of human culture to geographic influences," "Native culture of the Great Plains Region," and "The history of Indian corn."

THE death is announced of A. Montuori, instructor in physiology at the University of Rome and director of the Institute for Physical Education and Experimental Physiology.

THE forestry department of the University of California, and its head, Professor Walter Mulford, believes that the intimate relation between the forest and wild life demands that the well-trained forestry student know something of fish and game and methods by which this resource may be conserved. It therefore procured the services of Dr. Harold C. Bryant, in charge of the educational, publicity and research work of the California Fish and Game Commission, to give instruction on game fish, birds and mammals, their economic

value, and the means by which they may be conserved. The following were the subjects announced, each lecture illustrated with stereopticon slides.

April 5. "Geographical distribution of plant and animal life in California."

April 8. "Some common game and non-game birds of California."

April 10. "The economic value of birds."

April 12. "The game and furbearing mammals of California."

April 15. "Mammals in their economic relations."

April 27. "Food and game fishes and their conservation."

April 19. "Past, present and future of game in California."

April 22. "The national forests and wild life."

April 24. "Methods of wild life conservation."

Through the Urgent Deficiency Bill passed by Congress and approved by the President, March 28, 1918, the Bureau of Fisheries was provided with the sum of $80,000 for the construction and equipment of a fireproof laboratory building at Fairport, Iowa, to replace the frame building destroyed by fire on December 20, last. This prompt action of the Congress at the present time is a source of much gratification as an evidence of appreciation of the importance of the biological and fish-cultural experiment and other work accomplished and in progress at the station. Plans are being prepared in order that construction may be begun as soon as possible. Meantime, arrangements have been made whereby a limited number of temporary investigators can be furnished with working quarters and living accommodations during the coming season. The important work of the laboratory will therefore proceed with the least possible interruption.

The National Forest Reservation Commission has authorized the purchase by the government of 65,528 acres of land in the White Mountain and Southern Appalachians for inclusion in the Eastern National Forests. Four tracts, with a total of approximately 38,000 acres on the Nantahala Purchase Area in Macon and Clay counties, N. C., comprise the largest amount authorized in any one locality. The acquisition of these lands will give the government control of the majority of the mountain lands on the headwaters of the Nantaha River and will fill in the southern end of the area which it is planned to buy in that locality. Most of the land has either been cut over or is to be purchased subject to the removal of the timber under government regulations. Other lands whose acquisition was approved comprise 993 acres in Grafton county, N. H., and Oxford county, Me.; 14,676 acres in Highlands, Augusta, Amhearst and Botetourt counties, Va.; 2,788 acres in Avery, Buncombe, Yancey, and Macon counties, N. C.; 4,341 acres in Polk, Monroe and Unicoi counties, Tenn.; 2,898 acres in Winston and Lawrence counties, Ala., and 1,834 acres in Hardy county, W. Va.

The New York Civil Service Commission announces that it will receive applications for the position of mineralogist in the State Museum at a salary of $1,600 ($1,740 beginning July 1, 1918) for men only. Applicants should be graduates of a university, college or technical school and specially trained in the science of mineralogy. They should also have a general knowledge of descriptive mineralogy with special knowledge of minerals occurring in the state of New York, together with knowledge of the economic uses of minerals and their application to modern industries.

Dean Thatcher and Professor Alway, of the division of soils of the University of Minnesota, have recently completed negotiations for securing a peat experimental farm near Goodrich, Minn. The law requires that there be maintained three such farms. They have been located at Dibbell, Goodrich and Anoka.

The government of Uruguay is discussing the foundation of an Academy of Sciences, Arts and Letters. It is proposed that it shall be composed of five institutes, one each for the medical sciences, the political sciences, the natural sciences, arts and belles lettres.

Free public lectures have been inaugurated at the Brooklyn Botanic Garden by a course of "Win-the-War-Garden" lectures, scheduled for Sunday afternoons at 4 o'clock. The lectures illustrated by lantern slides and otherwise are given in the lecture hall of the new

laboratory building. A motion-picture apparatus is being installed in the lecture hall to be used especially in connection with lectures to children. The following lectures were announced:

April 7. "Farming for women." Miss Sophia de M. Carey, official lecturer of the British government; Miss Elizabeth Cleveland and Mrs. Florence Young, Bedford farmerettes and members of the Woman's Land Army of America.

April 14. "The back yard vegetable garden." Miss Jean A. Cross, assistant curator of elementary instruction.

April 21. "Forest products and the war" (Arbor Day Lecture). Professor Samuel J. Record, school of forestry, Yale University.

April 28. "Diseases of garden crops and how to control them." Dr. Edgar W. Olive, curator of Public Instruction.

May 5. "Plant breeding and increased food production." Dr. Orland E. White, curator of Plant Breeding.

May 12. "Bacteriology and the war." Dr. Ira S. Wile, former member of the Board of Education, New York City.

May 19. "Garden insects—good and bad." Dr. E. P. Felt, State Entomologist of New York.

May 26. "Cultivation of drug plants." Dr. W. W. Stockberger, in charge of drug and poisonous plant investigations, U. S. Department of Agriculture.

THE Sigma Xi Society of Syracuse University has arranged a number of public lectures to inform the students and general public of interesting and timely scientific problems. In addition to those already reported the following have been held:

January 11. "The service of botany to the nation during and after the war." Dean Wm. L. Bray, of the Graduate School of Syracuse University.

April 5. "Mt. Katmai and the valley of ten thousand smokes." Professor Robert F. Griggs, of Ohio State University, director of the National Geographic Society's expeditions to Mt. Katmai.

April 19. "The habits of spiders." Professor J. H. Comstock, emeritus professor of entomology of Cornell University.

THE summer meeting of the American Institute of Chemical Engineers will be held in Berlin, N. H., June 19–22. Headquarters will be at Mt. Madison House, Gorham, N. H.

THE National Medical Institute of Mexico, founded in 1890 for research on and exploitation of the flora, fauna and climatology and geography of Mexico has been transformed into the Institute of General and Medical Biology by a recent decree. The institute has been engaged in the study and classification as well as the action of native plants.

THE Royal Academy of Sciences of Turin, Italy, has announced a prize of 26,000 lire, to be awarded for the most remarkable and most celebrated work on any of the physical sciences published in the four years ending December 31. The prize fund is a bequest from a senator of the realm, T. Vallauri. Competition is open to Italian and foreign scientific men, and the term "physical sciences" is to be taken in the broadest sense.

THE Provost Marshal General made public the following: "Under such regulations as the Chief Signal Officer may prescribe, a proportion of the students in institutions in which the Signal Corps has established a course in electrical communication, who have completed at least two and a half years of the course in electrical engineering, or its equivalent, in one of the approved technical engineering schools listed in the War Department, may enlist in the Signal Enlisted Reserve Corps, and thereafter, upon presentation by the registrant to his local board of a certificate of such enlistment, such certificate shall be filed with the questionnaire and the registrant shall be placed in Class 5 on the ground that he is in the military service of the United States."

UNIVERSITY AND EDUCATIONAL NEWS

UNDER bequests of the late William Brechin Faulds, of Glasgow, a research fellowship in medicine, of the annual value of about £200, tenable for three years, has been founded in the university. The Ferguson trustees have announced their intention of founding a research fellowship in applied chemistry, also of the annual value of £200.

THE new agricultural building of the Maryland State College of Agriculture, costing

$175,000, will be dedicated during "Farmers' Day" at the college on May 30.

The contract has been let for the construction of a new fireproof chemistry building at the Montana State College, Bozeman. This building replaces the one destroyed by fire in October, 1916. The building will cost $110,000, exclusive of furniture and is 130 × 60. This forms a unit of a larger building plan to be developed as the institution grows. The building will furnish quarters for the experiment station and college departments of chemistry as well as quarters for the state food and water laboratories.

Dr. A. E. Kennelly, professor of electrical engineering at the Massachusetts Institute of Technology, has been appointed acting head of the electrical engineering department of the institute during the absence of Professor Jackson, who has been commissioned a major.

At the Harvard Medical School three members of the medical faculty have been promoted to full professorships as follows: Dr. Richard C. Cabot, clinical professor of medicine; Dr. Eugene A. Crockett, Le Compt professor of otology, and Dr. F. S. Newell, clinical professor of obstetrics.

Lester F. Weeks, assistant professor of chemistry in the University of Maine, has been appointed assistant professor of chemistry at Colby College to succeed Dr. Robert G. Caswell, who has resigned.

At Wellesley College, Lincoln W. Riddle, associate professor of botany, William Skarstrom, associate professor of hygiene, and Roxana Hayward Vivian, associate professor of mathematics, have been appointed to full professorships.

DISCUSSION AND CORRESPONDENCE

WALNUT POLLEN AS A CAUSE OF HAY FEVER

The prevalent assumption that the tree pollens play only a minor rôle, if any, as causative factors in hay fever must now be abandoned, since one species alone has been demonstrated to be the cause of hundreds if not indeed thousands of cases in California.

The spring type of this malady is very troublesome in the Sacramento valley, where it has been commonly attributed, even by physicians, to locust and to orange pollen. However, predictions based upon botanical characters that these pollens would give negative results were thoroughly substantiated by intradermal tests in which the pollen extracts were used. At the request of Dr. Grant Selfridge, of San Francisco, the writer therefore visited the city of Colusa in April, 1917, to determine, if possible, the specific cause or causes of the trouble. It was noted that the native California black walnut (*Juglans californica* var. *Hindsii* Jepson) was much used as a street tree, that the abundant pollen sifted down over the city just at the time when the disease was most prevalent, and that the disease disappeared soon after the close of the flowering period. It was also learned that when patients left the region temporarily to escape the disease they were free from the symptoms, except when passing through towns where the black walnut grew. Finally, the botanical characters of the pollen were exactly those which one would expect in a hay-fever plant. Since this evidence all pointed to the walnut as probably the chief offender, samples of the pollen were gathered and biological tests were made by Dr. Selfridge on some eight subjects. In each case the results were positive.

Twelve hay-fever subjects were also examined at Chico, a neighboring city, where cases are abundant during the spring and where the walnut is much grown as an ornamental tree. In every case positive reactions were obtained with extracts prepared from the California black walnut pollen, whereas the controls gave no reactions. Other pollen extracts gave results in a few cases, indicating that the subjects were sensitive to these also. This was especially true of western mugwort (*Artemisia heterophylla*) which is a common cause of the fall type. The intradermal tests were verified by direct application to the nostrils, and the well-known symptoms of hay fever were immediately produced in each case.

The treatment of numerous hay-fever subjects in the Sacramento and neighboring val-

leys to render them immune to hay fever is now under way and the serums prepared from the black walnut pollen are the ones most used. It is expected that by this means the spring type of the malady can be largely eliminated in those districts. A more direct method would be to remove the trees, or, better yet, to graft the tops over to English walnut, which rarely, if ever, causes hay fever. By this latter method the beautiful and stately trees along the highways and in the parks could be preserved, but it would doubtless be difficult to bring about unanimity of action.

The relation of the eastern black walnut to hay fever should now be determined since that species is closely related botanically to our western form. It may also be pointed out that perhaps the most significant result of our studies, which cover the region from the Rocky Mountains west, is the discovery that hay fever is here produced by an almost entirely different flora from that which causes it in the eastern states and in Europe, and that the exact species involved must be determined in each case before treatment for immunity is undertaken. Botanical surveys and clinical tests have been carried on by Dr. Selfridge and the writer in order to determine the most important species for each district and these will be continued as opportunity offers.

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THE CANONS OF COMPARATIVE ANATOMY

IN a recent number of this journal[1] Professor E. C. Jeffrey uses "an article on the vessels of *Gnetum* in the January number of the *Botanical Gazette*" as a "flattering testimonial" to the soundness of what he has called the canons of comparative anatomy and at the same time (to modify his pun) as an illustration of poor marksmanship in the use of those canons. As the author of that article and as a firm supporter of those canons, I am glad to offer my work as a testimonial to their soundness and to their effectiveness in anatomical offensives. But, according to Professor Jeffrey, my marksmanship was defective because I stated—and in so doing showed "surprising ignorance"— that the vessels of *Gnetum* are different from those of angiosperms. Aside from the fact that this statement does not involve the use of the canons at all, the whole theme of the article was that the *same* type of vessel has been evolved in *Gnetales* and angiosperms in entirely different ways. On page 90 for example I wrote:

> The possession of vessels by the two groups . . . is to be used as a remarkable illustration of development by different plants of the *same* highly specialized structure.

Again on page 89 after speaking of the perforation of the Gnetalean vessel I said:

> We have also seen that the similar single large perforation of the angiosperm vessel, etc.

Professor Jeffrey seems to have misunderstood what was in my mind because of my statement that the vessel of *Gnetum* is like the *highest* angiosperm type except that as a rule it exhibits a narrow border. Yet every anatomist will agree that this statement is absolutely correct because the *highest* type of angiospermic vessel *has no* border on its perforations. Of course every anatomist knows that the perforations of many angiospermic vessels do show a border as do those of *Gnetum*, but these are not of the highest type.

It appears, therefore that our modern scientific promulgator of canons is in certain respects remarkably like his ecclesiastical predecessors.

W. P. THOMPSON

ALBINO TURKEY BUZZARDS

IN a recent issue of SCIENCE[1] there appeared an interesting note on the supposed occurrence of albino turkey buzzards (*Cathartes aura aura*) in Mexico, to which Mr. E. W. Nelson has called the writer's attention. This was based on the account of white "Carrion Crows" given by Captain William Dampier in his "First Voyage to the Bay of Campeachy." That Dampier mentions these white birds as of more or less common occurrence in that locality at once raises a doubt of their identification as turkey buzzards; and this

[1] SCIENCE, N. S., Vol. XLVII, No. 1214.

[1] Gudger, SCIENCE, N. S., Vol. XLVII., No. 1213, March 29, 1918, pp. 315–316.

doubt is strengthened almost to a certainty by recollection of the fact that the king vulture, which is well known in that region, is of about the same size and general habits as the turkey buzzard, and in plumage almost wholly white or whitish; as Dampier expresses it, "their Feathers looked as if they were sullied." Furthermore, he states that the inhabitants of Campeche called them "King-Carrion Crows." It is evident, therfore, that we must identify Dampier's white "Carrion Crows" as king vultures (*Gypagus papa*).

It might be well, moreover, in this connection, to mention that albinos of the turkey buzzard, or, as it is more properly called, the turkey vulture (*Cathartes aura*), are by no means extraordinary, though of course not common. The present writer has, during the course of several years, examined a number of specimens; and among recorded instances we might mention that of Nauman in Florida[2] and Gundlach in Cuba.[3]

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SCIENTIFIC BOOKS

The Early Mesozoic Floras of New Zealand: By E. A. Arber. New Zealand Geological Survey, Paleontological Bulletin No. 6. 1917.

Fossil plants have been known from New Zealand for over half a century, but there has never been a comprehensive account of them published, and the wide variations in the opinions of the local geologists and paleontologists regarding the ages of the important stratigraphic units has made it impossible for students elsewhere to reach any intelligent understanding of the situation. Such an understanding is especially important in the case of so interesting and strategic a region, and its former relations to Gondwana Land, Antarctica and Australia have long been controverted questions.

The present comprehensive account of the older Mesozoic floras is therefore of great value to paleogeographers and to students of geographical distribution. The more important localities from which the fossil plants are described are the Rhætic of Mount Potts and Clent Hills in Canterbury and the Hokonui Hills in Southland; Owaka Creek in Otago is doubtfully referred to the Rhætic; Mokoia and Metaura Falls in Southland are referred to the lower Jurassic; Malvern Hills in Canterbury is doubtfully referred to the lower Jurassic; Waikawa in Southland to the middle Jurassic; and Waikato Heads in Auckland to the Neocomian.

The disputed question of the occurrence of *Glossopteris* is definitely answered in the negative and it is shown that there was considerable specific variation between the Rhætic flora of New Zealand and that of Australia, India and South Africa. The Jurassic floras appear to show less specific differences when compared with other areas. The author concludes that New Zealand was surely united with Australia during Rhætic and Jurassic times, but he objects strongly to using the term Gondwana Land for anything post-Paleozoic, although it is obvious that the existence of Gondwana Land as a geographical region did not cease with the close of the Paleozoic. Many geologists have also reached the conclusion that the evidence for the lower Permian age of the glacial period is sufficiently good to warrant the dropping of the term Permo-Carboniferous for it, although doubtless this practise will survive indefinitely in more conservative countries like Great Britain.

It would seem to the reviewer that it would have been preferable to use Mesozoic instead of Mesophytic for the floras discussed, since the latter term has a well-understood ecological significance. The perpetuation of the use of *Sphenopteris* for post-Paleozoic fern fragments is also to be deprecated, and it is questionable if clearness of understanding is facilitated by substituting *Tæniopteris* for *Oleandra* and *Macrotæniopteris*. Of great interest is the discovery of two forms of dicotyledonous leaves in beds referred to the Neocomian. These are described by Professor

[2] *American Naturalist*, IV., August, 1876, p. 376.
[3] *Auk*, VIII., April, 1891, p. 190.

Laurent, of Marseilles, who refers one to Unger's genus *Artocarpidium* and does not venture beyond *Phyllites* in the identification of the other.

While not absolutely unique, even if the age is as great as is assigned to them, since some of the leaves described by Fontaine from the Neocomian of Virginia may be dicotyledonous, the New Zealand examples are less ambiguous. It may be pointed out however that Lower Cretaceous and Neocomian are not synonymous terms, as one might infer the author to believe, and no evidence is presented which would indicate that these New Zealand deposits could not be Barremian, Aptian or even Albian in age, and in the last stage dicotyledons are fairly common in both America and Europe.

A table giving the distribution of the New Zealand species in other regions would have added much to the usefulness of the report.

E. W. BERRY

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SPECIAL ARTICLES

THE FACTORS INFLUENCING THE ATTITUDE OF THE HEAD IN ANIMALS WITH INJURY TO ONE OTIC LABYRINTH

MAGENDIE, more than a century ago, recognized that the central nervous system participated in the maintenance of the attitudes of the body as well as in its movements. Recently Sherrington has called attention to this function under the head of the postural activity of muscle nerve. The attitude of the head is one of the characteristics of experimental removal of one otic labyrinth in animals, and the analysis of the factors involved becomes of importance from the point of view of the relation of the attitude of the head to the maintenance of the position of the body in space and hence, to the problem of the maintenance of equilibrium, as well as from its own intrinsic interest. This analysis was begun by Dr. A. L. Prince, of Yale,[1] in this laboratory more than two years ago, but his service in a base hospital of the American Forces in France led to an interruption of the experiments. We desire to add a brief statement of new experiments at this time. We hope later to publish the data in full with Dr. Prince as the senior author.

The torsion of the head, always seen after removal of one otic labyrinth, with the occiput turned toward the injured side, largely disappears after removal of the homolateral cerebral motor cortex in dogs. The torsion reappears if the heterolateral cerebral motor area is removed some weeks or months after the ablation of the homolateral area.

The torsion of the head is greatly increased, and the rolling movement toward the side of the injured labyrinth, together with the ocular movements (ocular nystagmus) reappear, if the heterolateral cerebral motor cortex is removed some weeks after the time of the labyrinthine operation. Rolling movements of the animal to the side of the remaining cerebral motor area reappear, but no nystagmus, if one cerebral motor area is removed some weeks after bilateral labyrinthine operation.[2]

Our experiments have given a new interest to Magendie's statement that the division of the central nervous system into segments, *e. g.*, medulla oblongata, cerebellum and cerebrum, is an artificial division from the point of view of the physiologist, and that all parts must be considered together in arriving at an estimate of its functions.

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F. H. PIKE

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A SLOW-SPEED KYMOGRAPH

PHYSIOLOGISTS and others using the "medium-spring" kymographs of the Harvard Apparatus Company, which are not provided with a slow-speed mechanism, may be interested in a simple device I have used for materially reducing the speed of the drum. It is shown in the appended figure. A small hole is drilled in the upper corner of the largest fan, and into it is tied a strong but flexible

[1] *Proceedings of the Society for Experimental Biology and Medicine*, 1916, XIII., p. 156.

[2] Unpublished experiments by Drs. Strauss and Friesner.

thread. To the other end of the thread is attached a lead ball a quarter inch in diameter. The length of thread and ball together is equal to the width of the fan. An L-shaped brass wire, with the short arm ending in a loop, is fastened to the top of the kymograph by the screw nearest the fan. The fan clears the vertical arm of the wire by a quarter inch. As the fan revolves, the lead weight swings outward and winds itself momentarily about the upright wire, bringing the fan to a brief halt at each revolution. The speed of the

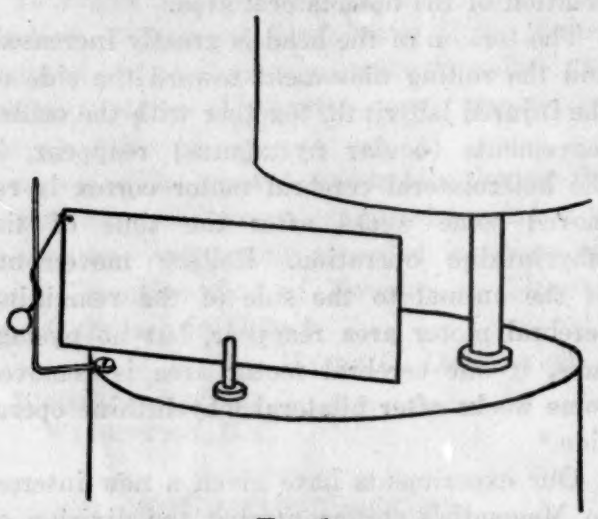

Fig. 1.

drum is thus reduced from one revolution in half an hour to one revolution in three hours and a half. Once properly adjusted the device works unfailingly.

Eugene L. Porter
Department of Physiology,
The University of Pennsylvania

THE AMERICAN MATHEMATICAL SOCIETY

The one hundred and ninety-eighth regular meeting of the society was held at Columbia University on Saturday, April 27, extending through the usual morning and afternoon sessions. Thirty-three members were in attendance. Professor H. S. White presided at the morning session and Professor W. B. Fite at the afternoon session. The following new members were elected: Mr. Oscar S. Adams, U. S. Coast Survey; Professor William P. Parker, Union Christian College, Pyeng Yang, Corea; Dr. Eugene F. Simonds, University of Illinois. Seven applications for membership were received. Professor P. F. Smith was reelected a member of the Editorial Committee of the *Transactions*. A committee was appointed to consider the question of the publication of the recent Chicago symposium.

The following papers were read at this meeting:

Arnold Emch: "On plane algebraic curves with a given system of foci."

J. F. Ritt: "On the iteration of polynomials."

F. F. Decker: "On the order of the system of equations arising from the vanishing of determinants of a given matrix."

O. E. Glenn: "Modular concomitant scales, with a fundamental system of formal covariants, modulo 3, of the binary quadratic."

J. E. Rowe: "The quinquesecant line invariant of the rational sextic curve in space."

F. H. Safford: "Parametric equations of the path of a projectile when the air resistance varies as the nth power of the velocity."

C. L. E. Moore: "Surfaces of rotation in space of four dimensions."

C. L. E. Moore: "Translation surfaces in hyperspace."

Mary F. Curtis: "Note on the rectifiability of a space cubic."

F. R. Sharpe and Virgil Snyder: "Certain types of involutorial space transformations."

Caroline E. Seely: "On kernels of positive type."

J. W. Hopkins: "Some convergent developments associated with irregular boundary conditions."

J. R. Kline: "A necessary and sufficient condition that a closed connected point set that divides the plane into two domains be a simple curve."

Edward Kasner: "Equiliong symmetries and a related group."

H. B. Phillips: "Functions of matrices."

G. H. Hallett, Jr.: "Linear order in three-dimensional euclidean and double elliptic spaces."

H. S. Vandiver: "On transformations of the Kummer criteria in connection with Fermat's last theorem."

H. S. Vandiver: "A property of cyclotomic integers and its relation to Fermat's last theorem."

H. S. Vandiver: "Proof of a property of the norm of a cyclotomic integer."

The San Francisco Section met at Stanford University on April 6 and the Chicago Section at the University of Chicago on April 12–13. The next meeting of the society will be the summer meeting, at Dartmouth College, early in September.

F. N. Cole,
Secretary